NASA Water Information System Platform for the Middle East and North Africa Region

Addressing Water Resources Management through NASA Earth Observations

Objectives

Understand the water balance, provide scientific products to address water resources and information on climate change for societal benefits in conjunction with assisting in building regional expertise. This program utilizes NASA Earth Science satellite observations and models in conjunction with ground measurements to address these problems.

Earth Observations

Study Area

Background

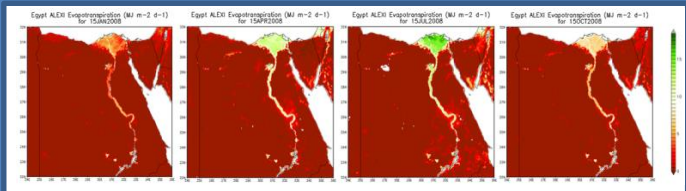
The scarcity of freshwater in most countries of the Middle East and North Africa (MENA) region is an increasingly acute problem, particularly as populations grow, rapid urbanization continues and the pressure to shift water from agriculture (which consumes over 84% of the region's water resources on average) to domestic and industrial uses increases. Fourteen of twenty MENA nations are classified as being in water deficit (> 500 m^3 / year). The Intergovernmental Panel on Climate Change further reports an expected precipitation decrease over the next century by over 20% for large parts of the MENA region, a likely increase in the frequency and severity of droughts and a reduction in groundwater recharge rates.

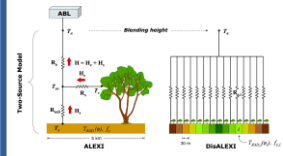
Issues Addressed

Thematic Areas	Egypt	Jordan	Tunisia	Lebanon	Morocco
Evapotranspiration	x	x	x	x	x
Drought	x	x	x	x	x
Floods Detection and Modeling			x	x	x
Climate Change Impact	x	x	x	x	x
Crop Mapping & Irrigation	x	x	x	x	x
Hydrological Modeling and Analysis	x				x

Project Components

Evapotranspiration and Drought

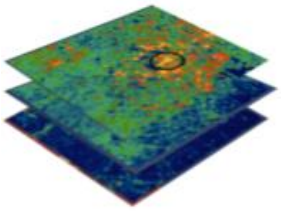


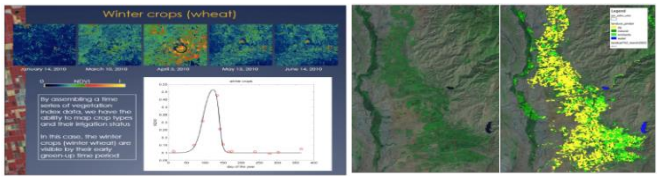


The Atmosphere-Land Exchange Inverse (ALEXI) technique uses the real time morning surface temperature rise as measured from a geostationary satellite platform to deduce surface energy and water fluxes at 3 km and 90 m resolution over the MENA region. Poor ET conditions can give early indications of meteorological drought.

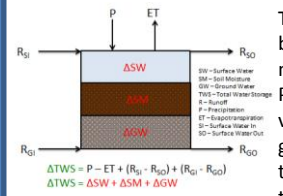
Crop Mapping and Irrigation

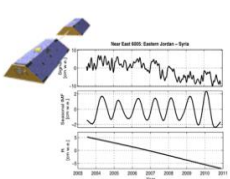
This technique uses the "temporal" signature in satellite data (e.g., Landsat) to distinguish summer and winter crops by their phenological development characteristics. The Decision Tree Classifier algorithm uses multiple satellite images annually to produce irrigated versus non-irrigated crop maps.





Water Balance

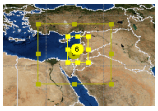


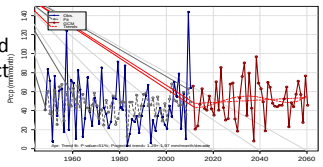


The ultimate goal is to understand the water balance at the basin level to assist decision makers in optimal water utilization. Precipitation, evapotranspiration in the vegetated areas, evaporation, surface and ground water runoffs are main components of this methodology. NASA is developing techniques and tools which are going to help measure and calculate these components to achieve the results at the basin level. NASA's GRACE satellite gravity measurements and models play a significant role in understanding total column water variability. This information is integrated with surface and ground water models to achieve water balance.

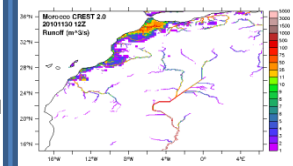
Climate Analyses

NASA is downscaling dynamically and statistically climate data to understand future climate impact on agriculture and precipitation.





Flood Mapping and Modeling



NASA has developed unique algorithms to map flooding events in near real time using high temporal, moderate spatial resolution satellite data. Modeling framework is being used to model nominal versus abnormal water flows.

Project Partners

USAID, Arab Water Council, ICBA

Country Members

10/09/2014